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Research Paper

"Stop bullying now!" Investigating the effectiveness of a serious game for teachers in promoting autonomy-supporting strategies for disabled adults: A randomized controlled trial

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ABSTRACT

Background: Individuals with disabilities are at heightened risk for bullying and can lack the ability to cope in bullying situations. Teachers and caregivers have an important responsibility to promote optimal strategies for individuals with disabilities to cope with bullying. Three types of strategies have been identified: autonomy-supporting, autonomy-neutral, and autonomy-undermining strategies.
Objectives: The current study investigates the effectiveness of a serious game, "Stop bullying now!", for teachers to use in working with individuals with disabilities to enhance autonomy-promoting strategies and increase generalized self-efficacy.
Methods: In this superiority parallel randomized controlled trial, we tested 150 participants in three conditions: the experimental group ($n = 62$) played the serious game for 20 min, the active control group ($n = 41$) read a digital information package about bullying, and the passive control group ($n = 47$) read a digital information package that was not bullying related. Outcomes were measured before and after the interventions and at 4–6 weeks of follow-up.
Results: The serious game significantly improved autonomy-supporting strategies post-intervention, and marginally significant effects were identified at follow-up. The experimental group did not significantly differ from the active control group, and the experimental group and the active control group showed significant improvements compared to the passive control group.
Conclusions: Findings suggest that playing the serious game yields positive effects in promoting autonomy-supporting strategies compared to not receiving an intervention. The effects are comparable to reading the information based on which the game was developed.

Bullying represents a major public health issue, with prevalence rates as high as 20.8% in the general population[1] and reportedly higher rates among vulnerable populations, such as individuals with autism (33.9%)[2] or intellectual disabilities (31.4%).[3] Bullies often choose their targets based on physical appearance, disability, race, or religion,[4] and bullying behaviors frequently entail prolonged exposure to physical and/or emotional abuse, teasing, harassment, mocking, and/or social exclusion.[5] Most research has focused on bullying among children in the school environment, although bullying is a worryingly widespread phenomenon that extends into adulthood. In fact, recent evidence indicates that 41.7% of visually impaired individuals experience lifetime bullying.[6] These results suggest at an immediate need to identify effective interventions for gatekeepers, such as caregivers and teachers, to promote the development of potentially helpful strategies for disabled adult victims of bullying.

Victims of bullying may often feel hopeless[7] or lack the ability to handle the situation, which places them at higher risk for exposure to violence.[8] Individuals with severe disabilities may not be capable

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of physically or emotionally defending themselves from the perpetrators or reporting the act of violence. However, a key factor is how others handle the situation when witnessing a bullying episode. Individuals with disabilities may live in residential care and/or experience reduced social support.[9] Caregivers and teachers play a fundamental role in the detection, prevention, and protection of victims against bullying. Bullying towards people with disabilities has been identified as a major problem that necessitates joint efforts from the scientific community, policy-makers, caregivers, and teachers. Surprisingly, only a handful of studies have been documented in a systematic review of the literature on the effectiveness of interventions to handle violence against people with disabilities, and this handful of interventions proved ineffective.[10] It remains unclear how disabled victims of bullying can best be supported to attain higher self-efficacy and adopt optimal strategies in responding to bullying.

According to the self-determination theory, two types of strategies can be identified in educational settings: autonomy-supporting and controlling strategies.[11] Autonomy-supporting strategies promote higher perceived competence, self-development, self-esteem, and creativity, whereas controlling strategies indicate a more repressed environment with little self-efficacy and dependency of the student.[12] When dealing with bullying, it is fundamental to equip the victims with autonomy-supporting strategies to support independent coping skills. Yet teachers and caregivers are confronted with challenging dilemmas of offering immediate protection by taking over the situation (*controlling strategy*) and thus undermining the autonomy of the victim or approaching the situation from an educational perspective, talking the victim through the bullying episode, and helping the victim identify and build optimal strategies for dealing with the bully (*autonomy-supporting strategies*). Bonnet and colleagues[13] proposed three types of strategies parents use to respond to their child when dealing with peer victimization of young children: autonomy-supporting strategies, autonomy-undermining strategies, and autonomy-neutral strategies. In the autonomy-supporting strategies, parents scaffold children's social competence by asking the child to think of alternative responses to the situation and helping them to adopt an other-oriented reasoning. In the autonomy-undermining strategies, parents resolve the situation themselves by talking to the bully, but this approach elicits an image of immaturity and lack of competence of the child. In the autonomy-neutral strategies, parents do not enable higher competence skills or discourage them, and they offer only comfort. Evidence indicates that autonomy-supporting strategies lead to a decrease in peer victimization among young children.[3]

Bearing in mind the abovementioned information, teachers and caregivers need to become more aware of optimal strategies to support vulnerable individuals at high risk for bullying. In recent years, an increasing body of evidence has shown that serious games interventions are effective among healthcare professionals,[14–16] within educational settings for students with disabilities[17–20] and for bystanders of bullying episodes.[21] Despite the widespread benefits reported from these brief interventions, virtually no intervention has been tested for teachers and caregivers working with highly vulnerable populations as a training tool in handling bullying. Thus, we investigated the efficacy of a serious game for teachers working with disabled adults at high risk of being bullied, using the game to promote autonomy-supporting strategies among their students.

Serious game for teachers: promoting autonomy-supporting strategies for disabled adults at high risk of being bullied.

A serious game is defined as an alternative education tool, one that goes beyond entertainment with the aim of enabling learning in a digital and interactive fashion.[22] Playing a serious game "actively engages the player and enhances perspective taking of the different characters in the game".[23] The current serious game "Stop bullying now" (http://www.stopnumetpesten.nl/) was designed to help carers (i.e., parents, caregivers, teachers) to respond in a supportive manner to their children or students when bullying episodes occur. In an audiovisual user-friendly design, this game presents different characters and situations, such as children and adults with disabilities, parents, teachers, supervisors, and bullies showing different bullying behaviors. The aim of the game is to allow carers to understand different responses to these situations, and based on the illustrated episodes, they are required to answer what the most appropriate response would be. Players can gain points when giving a correct answer or receive more feedback when they give an incorrect answer. Achieving a high score indicates promotion of independence and autonomy. This game environment is unique in providing immediate reward or feedback to carers and potentially increasing self-efficacy of players in responding appropriately to challenging situations.

The current study

The current study's main aim was to test the effectiveness of the serious game "Stop bullying now!" (http://www.stopnumetpesten.nl) for teachers within a parallel randomized controlled trial (RCT), compared to an active and a passive control group, in promoting autonomy-supporting strategies for adults with disabilities at high risk for bullying. The second aim of this study was to investigate the effectiveness of the intervention in increasing self-efficacy in teachers. To address the aims of this study, we tested the hypothesis that playing the serious game "Stop bullying now!" would lead to promotion of more autonomy-supporting strategies compared to an active control group (reading an article about bullying[24]) and a passive control group (reading a text from a magazine with non–bullying-specific content). The serious game and the text read in the active control group had a great amount of content in common, but we hypothesized that playing the game would lead to a superior effect because of its interactive, reward, and feedback components. The effectiveness of the intervention was tested post-intervention and at 4–6 weeks of follow-up. To address our second aim, we tested whether playing the serious game led to higher self-efficacy in teachers compared to the two control groups.

Methods

Study design

The current study involved a superiority parallel RCT with three conditions. The experimental group played the serious game "Stop bullying now!", whereas the control groups read a digital text. The active control group read a text regarding strategies to handle bullying that consisted of the same material used to implement the serious game. The passive control group read a text containing general information about the organization, with no bullying content. The outcomes were assessed at three time points: pre-test (before the intervention), post-test (immediately after the intervention), and at follow-up (4–6 weeks after the intervention). The trial was conducted at two Dutch national governmental organizations specialized in special education for individuals with disabilities (i.e. visual impairments, multiple disabilities, intellectual disabilities). This RCT received approval by the policy advisors of the participating organizations).

Procedure and randomization

Teachers and caregivers received an invitation via their work

email to participate in this study. The invitation provided an explanation about the study and informed them that they could partake during work shifts. After agreeing to participate, teachers started the pre-test assessment (T0) on a laptop, following computer-based instructions. First, participants provided informed consent and were assessed with regard to demographic information, prevalence of bullying in their organization, self-efficacy, and strategies in handling bullying. After answering these questions, participants were automatically randomized via a computerized random assignment to one of the three conditions, based on the Mersenne Twister pseudorandom number generator[25]: the experimental group playing the serious game "Stop bullying now!", the active control group reading digital information about strategies for handling bullying, and the passive control group reading a general text without bullying-related content. The automatic randomization was implemented in the computer script, so their allocation to the three intervention arms was concealed. The researcher was blind to participant allocation, and the participants were unaware of the condition to which they were allocated. The intervention lasted approximately 30 min, after which the post-test (T1) assessment immediately followed, and after 4–6 weeks, the follow-up (T2) assessments were taken. Assessments at T1 and T2 included only the assessment of self-efficacy and strategies in handling bullying. Additionally, in the experimental condition, at T1, participants were asked to fill in a questionnaire about the social validity of the game. During the follow-up assessments, the control groups were offered a chance to play the serious game. A schematic illustration of the RCT and its measurements is provided in Fig. 1.

Study participants

A total of 155 participants were recruited, and 150 started the study. The demographics of each group are summarized in Table 1. Participants had on average 3.76 ($SD = 1.25$) years of experience working with people with disabilities and 63% reported of having a student victim of bullying at least once. The CONSORT flow diagram is given in Fig. 2.

Primary outcome measures

Handling bullying

Strategies for handling bullying were assessed with an adapted version of the Handling Bullying Questionnaire.[26] This questionnaire contains 26 items describing how the teacher/caregiver would respond when facing a given situation. We used a 20-item version, without one subscale, that was beyond the interest in our study. Answers were on a 5-point Likert scale ranging from 1 = "I definitely would not" to 3 = "I am unsure" to 5 = "I definitely would." An example statement is, "I would encourage the victim to show that he or she could not be intimidated." The scenarios provided to the participants consisted of five hypothetical vignettes illustrating various forms of bullying.[13] The items converged on four subscales: "Working with the victim," "Ignoring the incident," "Enlisting other adults," and "Disciplining the bully." For each subscale, a mean score was calculated, and each subscale demonstrated acceptable to excellent internal consistency. Internal consistency for each subscale was assessed pre-, post-test and at follow-up: "Working with the bully" (0.88, 0.96, 0.92), "Ignoring the incident" (0.91, 0.94, 0.90), "Enlisting other adults" (0.87, 0.88, 0.85) and "Disciplining the bully" (0.76, 0.92, 0.88). In the current study, the "Working with the victim" subscale was used as a proxy for autonomy-supporting strategies, and "Disciplining the bully" was used as a proxy for autonomy-undermining strategies. "Ignoring the incident" and "Enlisting other adults" were used as a proxy for autonomy-neutral strategies. A composite score was obtained by calculating the mean of the two subscales. The "Working with bully" subscale was not used in the analyses.

Secondary outcomes

Self-efficacy

Self-efficacy was measured with the self-report questionnaire General Self-Efficacy Scale.[27–29] This questionnaire comprises 10 items on a four-point Likert scale, ranging from 1 = "not at all true" to 4 = "exactly true." A high score indicates a high level of self-efficacy in handling challenging or unexpected stressful events. Internal consistency was high, with a Cronbach's alpha coefficient of 0.91, in line with previous studies reporting sound psychometric properties of the scale.[6,30]

Interventions

Experimental group: "Stop bullying now!"

The experimental condition consisted of one computer-based session of playing a serious game, developed for teachers, caregivers, and parents to help them identify and use the most appropriate strategies (to promote support and autonomy) for handling bullying. "Stop bullying now!" (http://www.stopnumetpesten.nl/) displays several episodes in which characters with different disabilities are presented in certain situations where different bullying behaviors take place (i.e., a 31-year-old woman with a developmental age of 7 years, a girl with a hearing impairment, and a boy with visual impairment). The game is structured in six levels, and each level presents a disabled character in several situations, where the player is required to take the perspective of the character and the caregiver. Questions are prompted after each short clip (audiovisual), and based on correct/incorrect answers, points are awarded or detracted. Feedback is also offered for incorrect answers. Serious games for caregivers working with disabled people have been previously used as brief educational tools and shown to be effective in decreasing personal distress.[31] The game lasts approximately 30 min and can be played from any location at any time. Participants are offered a "Participation certificate" at the end of the game. An illustrative example can be found in Fig. 3 (http://www.stopnumetpesten.nl/).

In this situation, a blind boy named Michael is called names by a group of boys. When the teachers approach the group, the game stops, and the player has three options to respond to the following question: What can the teacher say or do in this situation? a) It makes me sad that children bully you like that; b) it is not nice and

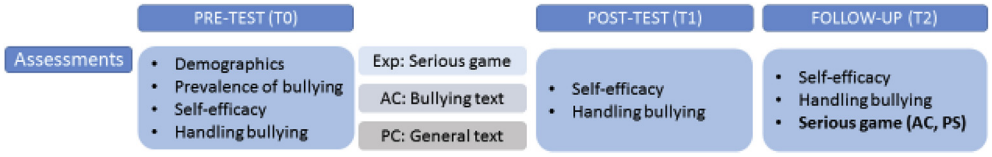

Fig. 1. A schematic illustration of the three arms of the RCT and the assessments at T0, T1, and T2. Exp = experimental group playing the serious game "Stop bullying now!"; AC = active control group, reading a text about strategies to handle bullying; PC = passive control group reading a general text.

Table 1
Characteristics of the study population (n = 150).

	Total (n = 150)	Experimental group (n = 62)	Active control group (n = 41)	Passive control group (n = 47)
Gender*				
Females	111 (74%)	40 (65%)	29 (70%)	42 (89%)
Males	27 (18%)	14 (23%)	9 (22%)	4 (9%)
Age (years)				
< 40 years	64 (43%)	27 (50%)	23 (60%)	14 (30%)
> 40 years	86 (57%)	27 (50%)	15 (40%)	32 (70%)
Experience with bullying	87 (58%)	30 (48%)	32 (78%)	25 (53%)

Notes. *12 participants did not report their gender. Experience with bullying refers to eye-witnessing bullying of their students.

fun when other children make fun of you. You are good the way you are!; or c) Don't worry, 'sticks and stones' (children's expression suggesting that people cannot be hurt by unpleasant words that are said to them). The correct answer to this situation is (b) because the teacher acknowledges that the situation is unpleasant and reassures the child that he is just good the way he is.

Active control group: bibliographic intervention

Digital information[24] regarding handling bullying was used as a bibliographic intervention for the active control group. The reading material was the same material used to develop the serious game in a graphical fashion. Similar information was presented in the two intervention conditions, with the aim to test for the superiority of the graphical implementation in a serious game of the handling-bullying content compared to just reading it. The rationale for comparing the two interventions is supported by the evidence that serious games promote more active engagement and are more effective compared to only reading a text or passively assisting someone playing the game.[23,31]

Passive control group: reading a text from a magazine

In the passive control group, participants were asked to read a digital text about the organization where they worked, without any bullying-related content. A digital text was chosen for the passive control group to maintain a format like that for the experimental and active control groups.

Statistical analyses

Data were analyzed with IBM SPSS Statistics 22.[32] To address our primary outcome, namely to investigate the effects of the serious game as compared to the control groups on strategies to handle bullying, a $3 \times 3 \times 3$ repeated-measures ANOVA analysis was performed with Time (pre, post, follow-up), Condition (experimental group, active control group, passive control group), and strategy (autonomy-supporting strategy, autonomy-neutral strategy, autonomy-undermining strategy). To address our secondary outcome, namely to investigate the effects of the serious game on general self-efficacy, we performed a 3×3 repeated-measures ANOVA with Time (pre, post, follow-up) $\times$ Condition (experimental group, active control group, passive control group), with general self-efficacy as the dependent variable.

Results

Does playing the serious game "Stop bullying now!" lead to better strategies in handling bullying, as compared to an active and a passive control group?

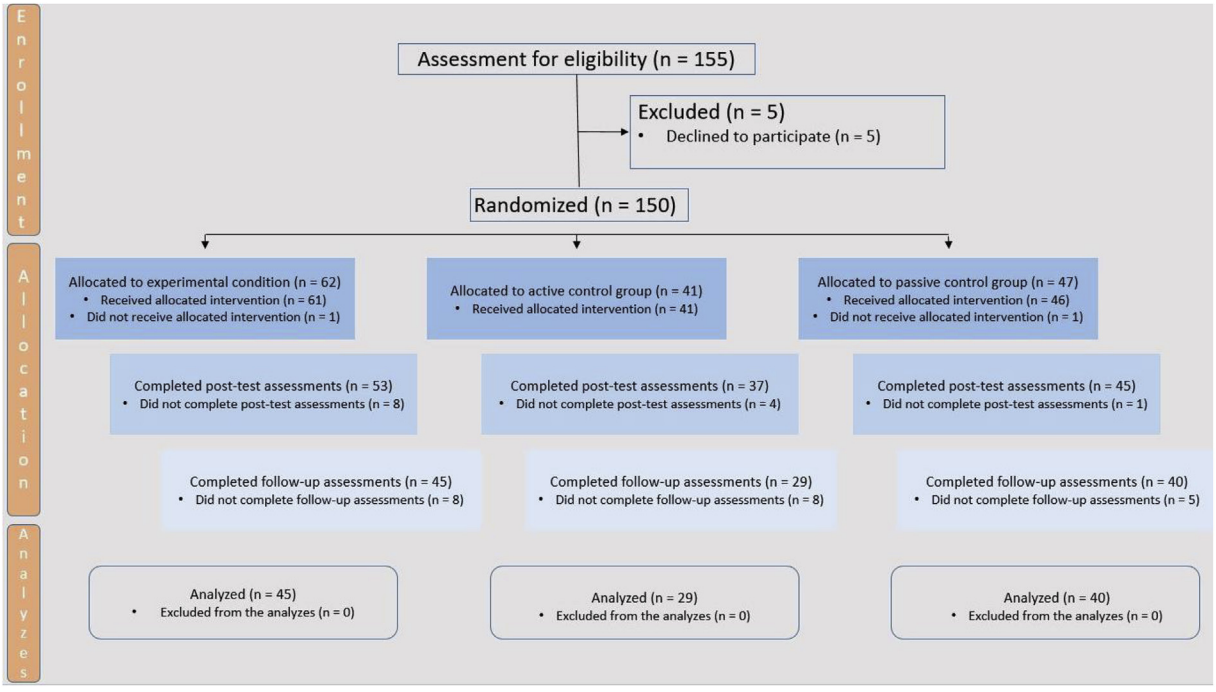

Fig. 2. CONSORT flowchart diagram of participants in the study: the experimental group was allocated to play the serious game "Stop bullying now!"; the active control group was assigned to read a text regarding handling bullying; and the passive control group was assigned to read a general text about the organization.

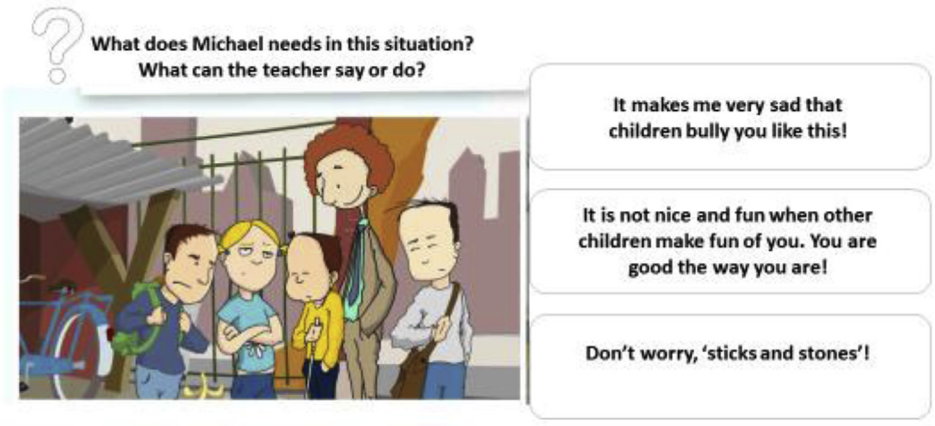

Fig. 3. An illustrative example of one of the situations portrayed in the Serious Game "Stop Bullying now!"

Repeated-measures ANOVA with Time (pre, post, follow-up), Condition (experimental group, active control group, passive control group), and strategy (autonomy-supporting strategy, autonomy-neutral strategy, autonomy-undermining strategy) yielded a significant three-way interaction [$F(4, 100) = 2.87$, $p = .005$, $\eta_p^2 = 0.10$]. Results revealed a significant interaction between time and strategy [$F(4, 99) = 13.09$, $p < .001$, $\eta_p^2 = 0.34$], a significant interaction between time and condition [$F(4, 102) = 5.58$, $p = .001$, $\eta_p^2 = 0.08$], and a main effect of time [$F(2, 101) = 333.05$, $p < .001$, $\eta_p^2 = 0.86$]. A Bonferroni correction was applied to correct for multiple comparisons. To disentangle the effects of the three-intervention groups, three separate repeated-measures ANOVA were performed for each strategy.

Autonomy-supporting strategies

Results from the repeated-measures ANOVA with Time (pre, post, follow-up) and condition (experimental group, active control group, passive control group) with autonomy-supporting strategies as the dependent variable yielded a significant time × condition interaction [$F(4, 35) = 5.59$, $p = .001$, $\eta_p^2 = 0.39$] and a main effect of time [$F(2, 37) = 136.16$, $p < .001$, $\eta_p^2 = 0.88$]. Post-hoc tests with paired samples t-tests showed that playing the serious game significantly increased autonomy-supporting strategies from pre-test ($M = 19.23$, $SD = 3.22$) to post-test [$M = 20.37$, $SD = 3.57$; with $t(52) = 3.28$, $p = .002$, $n = 53$], and a marginally significant increase from pre-test was still observed at follow-up [$M = 19.99$, $SD = 3.60$; with $t(44) = 1.97$, $p = .055$, $n = 45$]. Similarly, the active control group showed a similar pattern of improvement in autonomy-supporting strategies from pre-test ($M = 19.66$, $SD = 3.23$), with a significant increase at post-test [$M = 21.16$, $SD = 3.40$; with $t(36) = 3.59$, $p = .001$, $n = 37$], and a significant increase at follow-up [M = 21.37, SD = 3.67; with $t(28) = 2.30$, $p = .029$, $n = 29$]. Results revealed no significant differences in autonomy-supporting strategies in the passive control group between pre-test ($M = 19.42$, $SD = 19.78$) and post-test ($M = 19.78$, $SD = 3.65$) with [$t(43) = 1.24$, $p = .220$, $n = 44$], although a significant increase from pre-test emerged at follow-up assessment ($M = 20.85$, $SD = 2.60$) [with $t(38) = 2.89$, $p = .006$, $n = 39$] (Fig. 4).

Autonomy-undermining strategies

Results from the repeated-measures ANOVA with Time (pre, post, follow-up) and condition (experimental group, active control group, passive control group) with autonomy-undermining strategies as the dependent variable yielded a significant time × condition interaction [$F(4, 24) = 8.49$, $p < .001$, $\eta_p^2 = 0.58$] and a main effect of time [$F(2, 26) = 89.10$, $p < .001$, $\eta_p^2 = 0.87$]. Post-hoc tests with paired samples t-tests showed that playing the serious game significantly decreased autonomy-undermining strategies from pre-test ($M = 19.05$, $SD = 2.94$) to post-test [$M = 17.30$, $SD = 3.97$; with a difference of $t(52) = 4.09$, $p < .00$], and this significant decreasing effect was still observed at follow-up [$M = 17.60$, $SD = 3.58$; with a difference of $t(44) = 2.34$, $p = .024$, $n = 53$]. The active control group showed a similar pattern of diminishing autonomy-undermining strategies, with a significant decrease from pre-test ($M = 17.72$, $SD = 2.59$) to post-test [$M = 15.50$, $SD = 4.35$; with a difference of $t(36) = 4.09$, $p = .002$, $n = 37$], and a significant decrease at follow-up [$M = 15.67$, $SD = 4.10$; with $t(28) = 3.38$, $p = .002$, $n = 29$]. No significant differences emerged from pre-test ($M = 19.15$, $SD = 3.19$) to post-test ($M = 19.48$, $SD = 3.00$) in the passive control group [$t(43) = -0.411$, $p = .683$, $n = 44$] (Fig. 5).

Autonomy-neutral strategies

Results from the repeated-measures ANOVA with Time (pre, post, follow-up) and condition (experimental group, active control group, passive control group) with autonomy-undermining strategies as the dependent variable yielded a significant time × condition interaction [$F(4, 34) = 3.32$, $p = .021$, $\eta_p^2 = 0.28$] and a main effect of time [$F(2, 36) = 118.14$, $p < .001$, $\eta_p^2 = 0.86$]. Post-hoc tests with paired samples t-tests showed that playing the serious game

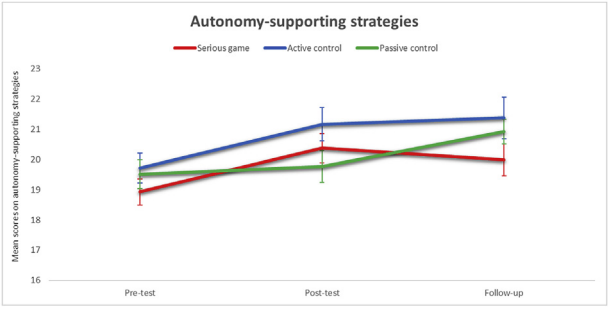

Fig. 4. Means and standard errors of autonomy-supporting strategies outcomes at post-test and follow-up, plotted compared to pre-test for the experimental condition (playing the serious game "Stop bullying now!"), active control group (reading a text about strategies to handle bullying), and passive control group (reading only a text with no bullying-related content).

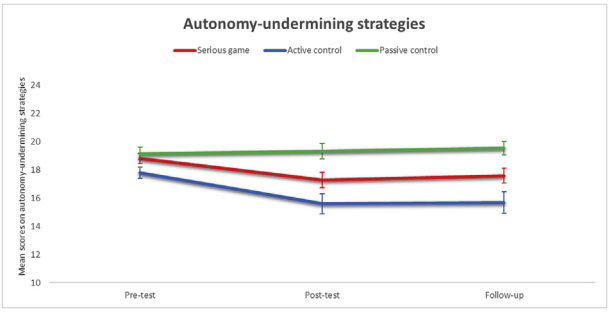

Fig. 5. Means and standard errors of autonomy-undermining strategies outcomes at post-test and follow-up, plotted compared to pre-test for the experimental condition (playing the serious game "Stop bullying now!"), active control group (reading a text about strategies to handle bullying), and passive control group (reading only a text with no bullying-related content).

significantly decreased autonomy-neutral strategies from pre-test ($M = 13.56$, $SD = 1.64$) to post-test [$M = 12.90$, $SD = 1.87$; with $t(52) = 4.50$, $p < .001$, $n = 53$], but this effect was not significant at follow-up [$M = 13.16$, $SD = 2.10$; with $t(44) = 1.31$, $p = .196$, $n = 45$]. In the active control group, no significant difference emerged from pre-test ($M = 13.69$, $SD = 13.43$) to post-intervention [$M = 13.43$, $SD = 1.74$; with $t(36) = 1.38$, $p = .122$, $n = 37$] in autonomy-neutral strategies. No significant differences emerged from pre-test ($M = 14.05$, $SD = 2.91$) to post-test [$M = 13.34$, $SD = 1.94$; with $t(43) = 1.86$, $p = .069$, $n = 44$] in the passive control group, either (Fig. 6).

Does playing the serious game "Stop bullying now!" increase self-efficacy in teachers, as compared to an active and a passive control group?

To address our secondary outcome of whether the serious game enhances general self-efficacy in teachers compared to reading digital information in two control groups, a repeated-measures ANOVA was conducted with Time (pre, post, follow-up) and condition (experimental group, active control group, passive control group) and general self-efficacy as the dependent variable. Results yielded no significant interaction between time and condition on general self-efficacy [$F(2, 107) = 0.35$, $p = .854$], indicating no difference in general self-efficacy across conditions at different time points.

Discussion

Individuals with disabilities are at heightened risk of bullying from childhood into adulthood; thus, it is crucial to identify strategies for handling bullying and specifically to train teachers, caregivers, and parents to respond in the most appropriate manner to bullying incidents. One recent study has shown that autonomy-supporting strategies are effective in tackling victimization in young children.[13] In the current study, we developed and tested a serious game intervention, "Stop bullying now!", for teachers working with adults with disabilities. Within a randomized controlled trial (RCT) design, we tested the effectiveness of the serious game intervention in increasing autonomy-supporting strategies and decreasing autonomy-undermining and autonomy-neutral strategies, as compared to an active control group and a passive control group. The serious game and the active control groups were offered the same type of content, aimed at promoting appropriate strategies in handling bullying, yet the crucial distinction between the two groups was the implementation. In the experimental intervention, the content was implemented in a serious game, in light of the positive reports about serious games interventions over the past decade.[15,16,21] In the active control group, participants read the digital information,[24] based on previous evidence suggesting that playing the game more actively engages the player and yields greater effects than passively reading a text.[23] The passive control group read an unrelated digital text, without any bullying-related content. The effectiveness of the intervention was assessed at post-test (immediately after the intervention) and at follow-up (4–6 weeks after the intervention).

Our results showed a significant interaction effect among time (pre, post, follow-up), condition (experimental group, active control group, passive control group), and strategy (autonomy-supporting strategy, autonomy-undermining strategy, autonomy-neutral strategy). Playing the serious game resulted in increased use of autonomy-supporting strategies and decreased use of both autonomy-undermining and autonomy-neutral strategies from prior the intervention to post-intervention and follow-up (except for the autonomy-neutral strategies that did not show a decrease in its use at 4-to-6-weeks assessment). Likewise, the active control group showed improvement in autonomy-supporting strategies and a decrease in autonomy-undermining strategies both post-intervention and at follow-up, yet no effects were found for autonomy-neutral strategies. As expected, in the passive control group, no differences emerged among the strategies. These results suggest that playing the serious game as well as reading a digital text about optimal strategies for handling bullying are both effective in promoting autonomy-supporting strategies and lowering autonomy-undermining and autonomy-neutral strategies, compared to no intervention. The experimental group and the active control group did not differ with regard to positive outcomes (i.e. increase in autonomy-supporting strategies and decrease in autonomy-undermining strategies), suggesting that the content used to develop the serious game is highly effective, regardless of its implementation (i.e. in the form of a virtual game or simply a digital text). Nevertheless, we argue that playing a serious game likely is more appealing to participants and importantly provides caregivers with direct feedback on their understanding of anti-bullying autonomy-supporting strategies.

In the current study, we further investigated whether playing the serious game enhances feelings of general self-efficacy in teachers. Results provided no evidence that reported self-efficacy differed across interventions and time. An important distinction between generalized self-efficacy and task-specific self-efficacy has been proposed by Miyoshi.[33] Generalized self-efficacy might not be changed even within a 2-week care-work training, yet this serious game improved task-specific care-work self-efficacy in the short term.[33] In the current study, although we did not find a significant change in generalized self-efficacy after the intervention, a task-specific self-efficacy might have been present but not detected by

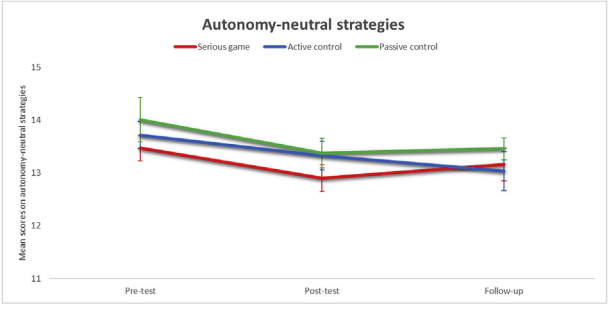

Fig. 6. Means and standard errors of autonomy-undermining strategies outcomes at post-test and follow-up, plotted compared to pre-test for the experimental condition (playing the serious game "Stop bullying now!"), the active control group (reading a text about strategies to handle bullying), and passive control group (reading only a text with no bullying-related content).

our assessment instrument addressing generalized self-efficacy. Future studies also should consider task-specific self-efficacy to investigate the intervention effects.

Altogether, the findings suggest that intervening in the promotion of strategies for handling bullying supports teachers in increasing autonomy-supporting strategies and diminishing autonomy-undermining and autonomy-neutral strategies. A possible limitation of our experimental intervention, playing the serious game "Stop bullying now!", is the short duration. Previous evidence suggests that serious games are more effective when they comprise multiple training sessions and when players work in groups.[34] Nevertheless, in the current study, the serious game intervention yielded a significant positive effect with a 20-min session, an effect that was still observable at 4–6 weeks of follow-up, highlighting the benefits of this serious game intervention within a challenging setting. Relatedly, a noteworthy point is the time difference that participants were engaged in each condition: while participants in the experimental condition spent approximately 20 min playing the game, participants in the control conditions spent a varying amount of time, depending on their needs. This arises the questions as to whether participants were equally engaged in the participation of the study. Future studies should take into account the time factor and possibly instruct the participants to spend an equal amount of time reading the material. Moreover, specifically in the context of health and trainings for professionals, it is important to acknowledge group dynamics and to implement multi-player training sessions with several sessions. Indeed, serious games have the potential to become a platform for group meetings and broad discussions about how to handle bullying. For more general conclusions about the effectiveness of the serious game "Stop bullying now!", replication studies are needed in different educational settings and with more training sessions and a bigger sample size. Bearing in mind the attrition rates in longitudinal studies and the stratified design, a bigger sample size across large educational settings would be required.

Bullying represents a high emotional burden,[35] and this phenomenon is particularly prevalent in highly vulnerable populations, such as individuals with disabilities.[36] This study is one of the first stepping stones towards a training approach for teachers and caregivers working for people with disabilities, as principal gatekeepers and safeguards of victims of bullying. The results of this RCT suggest that both playing the serious game or using the digital information have the potential to enhance optimal strategies and diminish undermining strategies in handling bullying.

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Disclosures

The authors have no conflicts of interest to declare.

PS designed the study. PL was the coordinator of the study. PL, PS, JL and MB paticipted in the development of the serious game and research outline. PL and JL finalized the dataset. SV conducted the data-analyses. PL and PS wrote the first draft. SV wrote the second draft. All contributed to the final manuscript.

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